CIRCUIT DESCRIPTION

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Page 1

1 Paga

PANEL SYSTEMS DECODER CONNECTOR CIRCUIT FOR USE WITH 3-DIGIT SENDERS AND DECODERS

CHANGES

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DESCRIPTION OF CHANGES D.

The "LA" and "PF" leads are added as Option G through the (DF), (SF), and D.1 (TF), relays for use when the associated decoders and senders are arranged for prefix zero and/or prefix one toll route operation.

The "LA" lead through the (DG), (SG), and (TG) relays is assigned Option F D.2 to show previous wiring when Option G is not provided in the connector. Option F is rated A&M Only.

D.3 The "EA" lead through the (DG), (SG), and (TG) relays is assigned Option H for use when the associated decoders and senders are arranged for toll directing codes with prefix 1-1. Option H is rated A&M Only when decoders are arranged for prefix one toll route operation, Option H music be removed.

D.4 Notes 102, 108 and the Options Used table are changed to include reference to Options F, G, and H.

D.5 Note 110 and 111 are added.

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DEPT. 2364-JFP-RJJ-MD

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CIRCUIT DESCRIPTION

CD-21967-01 Issue 3-D Appendix 2-D Dwg. Issue 7-D

PANEL SYSTEMS DECODER CONNECTOR CIRCUIT FOR USE WITH 3-DIGIT SENDERS AND DECODERS

CHANOES

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 The "CC 0-7" leads (Option J) are added to be used when the associated decoder is arranged for operation with 3digit translators.

D.2 Lead "DT" (Option J) is added to Fig. 8 to be used when the associated decoder, arranged for operation with 3digit translators, appears in the first position in the first 3-digit translator connector frame associated with the 3digit translator group. D.3 Lead "DT" is shown on a terminal strip located on the decoder frame.

D.4 Option J is added to the Feature and Option table and to the Options Used table.

D.5 Note 109 is added.

Add under Paragraph 4. CONNECTING CIRCUITS - SD-96529-01 - 3-Digit Translator Connector.

All other headings, no change.

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CIRCUIT DESCRIPTION

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Page 1

1 Page

PANEL SYSTEMS DECODER CONNECTOR CIRCUIT FOR USE WITH 3-DIGIT SENDERS AND DECODERS

CHANGES

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 Lead "ADB" (option N) is added to figure 8 to be used when the associated decoder connects to the timing control circuit for all decoder busy.

D.2 Lead MBM is added to figure 8 to be used when the decoder connects to the traffic usage recorder as option K. Option M shows a record of wiring prior to this issue.

D.3 Lead "MBM" is shown on a terminal strip located on the decoder circuit.

D.4 Options K, M and N are added to the feature on Option Table and the Options Used table.

All other headings, no change.

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CIRCUIT DESCRIPTION SWITCHING SYSTEMS DEVELOPMENT DEPARTMENT CD-21967-01 Issue 3-D Dwg. Issue 5-D

PANEL SYSTEMS DECODER CONNECTOR CIRCUIT FOR USE WITH THREE-DIGIT SENDERS AND DECODERS

CHANGES

- B. CHANGES IN APPARATUS
- B.1 Superseded Superseded by

(TF) 263A relay	(TF) 287A relay
(TG) 1/2	(TG) 1/2
263A relay	287A relay
(SF) 263A relay	(SF) 287A relay
(SG) 1/2	(SG) 1/2
263A relay	287A relay
(DF) 263A relay	(DF) 287A relay
(DG) 1/2	(DG) 1/2
263A relay	287A relay

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 Leads 7DG, SK2 and SK3 "S" option are added to connect between sender and decoder when the feature is provided that requires the use of the auxiliary sender for multifrequency outpulsing.

D.2 Option S is added to the option used table.

D.3 This circuit is rated A&M only.

All other headings under Changes, no change.

1. PURPOSE OF CIRCUIT

1.1 This decoder connector is used in a panel office to connect 3-digit subscriber senders or key pulsing "A" switchboard senders with 3-digit decoders.

2. WORKING LIMITS

2.1 None.

3. FUNCTIONS

3.01 When a sender requires a decoder, upon receiving a signal from the sender, the decoder connector connects the sender to a decoder by the operation of multi-contact relays, and breaks down the connection by the release of the multicontact relays, when signaled by the sender.

3.02 The senders are divided into groups, each group having a separate connector to a common group of decoders. Within any one connector only one connection can be made at a time and in case of a simultaneous demand by two or more senders, they take their successive turns in a fixed order of precedence, depending upon their relative positions in the sender chain circuits.

3.03 As many connections through different connectors can be made simultaneously as there are decoders working. In case of simultaneous demand from two or more connectors when all the decoders, or all but one, are already busy, the connectors take their turns in a fixed order of precedence depending upon the relative positions which each connector has in the decoder chain circuits.

3.04 The decoder connector connects the decoder test circuit to the leads of any connector in the same manner as it connects a sender to the leads of any connector.

3.05 The senders associated with the particular connector to which the decoder test circuit is connected are made busy by the operation of the timing circuit after 5 to 12 seconds have elapsed.

3.06 By the operation of relay (TH) a circuit is closed over which the test circuit can connect this connector to any decoder.

3.07 By the operation of relay (DST) a circuit is closed over which the test circuit can connect directly to the leads to the decoder by the operation of multi-contact relays shown on the decoder circuit. Such a connection from the test circuit through a connector to a .
decoder and back to the test circuit, is made for the purpose of testing the leads through the connector. A direct connection

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from the test circuit to a decoder, without connection with any connector, is made for the purpose of testing the decoder.

3.08 When a decoder which has timed out connects with the trouble indicator circuit, the decoder connector records in the trouble indicator the number of the frame, the position of the connector on the frame and the order in the connector of the sender to which the decoder is connected.

3.09 A timing circuit in each connector gives an alarm and makes the associated senders busy in case the connector does not respond to a demand from a sender for connection with a decoder, or in case such a connection when established is held an excessive length of time.

3.10 A timing circuit in each decoder is started when the decoder is seized by a connector. It is also started if a decoder which is idle is made busy to all connectors by a ground on the DB lead, other than a ground applied by plugging in the DB jack.

3.11 Lamps are provided to indicate the sender involved when a connector time alarm is given.

4. CONNECTING CIRCUITS

when this circuit is specified on a key sheet the information thereon shall be followed.

SD-21193-01 - Subscribers Sender
SD-21382-01 - A Swbd. KP Sender
SD-21277-01 - 3-Digit Decoder Ckt.
SD-21188-01 - Decoder Test Ckt.
SD-21197-01 - Trouble Ind. Ckt.
SD-21234-01 - Misc. Ckt. per Sdr. Fr.
SD-21249-01 - Misc. Ckt. per Dec. Fr.
SD-21250-01 - Misc. Ckt. per Dec. Tst
Fr.
SD-21251-01 - Misc. Ckt. per Tbl.
Ind. Fr.
SD-21252-01 - Misc. Ckt. per Dec.
Conn. Fr.

DESCRIPTION OF OPERATION

5. CONNECTING SENDERS TO DECODERS

5.1 The senders are divided into a number of groups, each group of senders becoming part of a connector circuit. Each sender has two multi-contact relays (SF) and (SG) in the particular connector circuit in which the sender is forming the sender group. No sender appears in more than one connector. In each connector there are two multi-contact relays (DF) and (DG) for each decoder circuit and also two multi-contact relays (TF) and (TG) for the decoder test circuit.

5.2 In each connector the corresponding contacts which are in use on all the multi-contact relays are strapped together on one side in a multiple except for a few contacts which are used for control purposes. On the other side of the multiple the contacts of the sender relays are wired to their respective senders, the contacts of the decoder relays belonging to each decoder are multiple connector to connector and wired to the decoder circuits and the contacts of the test circuit relays are multiple connector to connector and wired to the test circuit.

5.3 A particular sender is connected to a particular decoder by operating multi-contact relays (SF) and (SG) of the sender and (DF) and (DG) of the decoder in the same connector circuit.

5.4 Only one sender multi-contact and one decoder multi-contact relay in a particular connector can be operated at one time and only one decoder multicontact relay belonging to a particular decoder can be operated at one time.

5.5 The decoder connector circuits are divided into as many blocks as there are decoder circuits, and each block of connectors takes a different one of the decoders as first choice. If that decoder is busy then the first decoder which is not busy is taken, the decoder circuits being arranged in a definite order in a chain circuit in each connector circuit.

If several connector circuits are seized by senders while the decoders all are busy, each decoder, as it becomes idle, is seized by a waiting connector circuit which has that decoder for first choice.

5.6 The test circuit is connected to a particular decoder through a particular connector by operating multicontact relays (TF) and (TG) in that connector, and by operating relay (TH) which closes ground through the (DR) lead for operating multi-contact relays (DF) and (DG) of the particular decoder in the same connector. The test circuit is connected directly to a particular decoder by operating relay (DST) which closes a

circuit for operating the test circuit multi-contact relays (TA) and (TB) shown on the decoder circuit. The test circuit can seize any decoder as required, but if the decoder is serving a connector at the time it is selected by the test circuit, the test circuit waits until the decoder is released before proceeding with the testing.

6. SEIZURE AND RELEASE OF CONNECTOR

6.1 The control circuit for each connector consists of one sender start relay (SS) for each sender in the connector, and test start relay (TS). In addition each connector has connector alarm relays (CA1), (CA2), (CA3), (CA4) and (CA5) for time alarm.

6.2 When a sender is ready for a decodemit connects battery to its start lead "ST" and to lead "CBS" and if the connector is not engaged, relays (SS) and (CA1) will operate to ground through the windings of relay (CA1). The multi-contact relay (SF) associated with the sender is operated by relay (SS) and connects the sender to the receiving leads of the connector. The operation of relay (SF) closes a circuit for operating relay (SQ) which connects the sender to the transmitting leads of the connector.

6.3 When the sender has finished with a decoder, it removes battery from
lead "ST", and relays (SS), and (CA1) release, followed by relays (SF) and (SG),
leaving the connector free for other senders, or the test circuit.

6.4 If one or more senders call while their connector is engaged, their (SS) relays may be operated depending upon the position in the sender chain circuit of the calling senders, with respect to the sender which has the connector engaged, but the calling senders must wait until the connector is freed and the (SS) relay is released belonging to the sender which engaged the connector before a new connection can be made.

7. SEIZURE AND RELEASE OF DECODER

7.1 The control circuit for each decoder consists of one start relay (DS) per connector, one connector busy relay CB per connector and as many of the relays, CBR to CBV as are required to provide one CB lead per connector circuit. In addition each decoder has alarm relays DA1 and DA2 and make busy jacks CB and DB. Each decoder has a CB jack in each connector circuit. 7.2 The operation of the sender multi-

contact relay (SF) connects the "ST" lead to the (DS) relay of the first idle decoder circuit through the (CB) relay normal contact. When the (DS) relay operates, it opens its normally closed con-tacts and relays (DA1) and (DA2) release, closing ground to the alarm start "ST" lead. The (DS) relays are arranged in a chain circuit which extends from a (DS) relay in one connector to the (DS) relay belonging to the same decoder in the succeeding or preceding connector circuits. The first (DS) relay in the chain is in the block of connectors which has the particular decoder for first choice and all other connectors, block by block, are in a fixed order in the chain circuit and the connectors in each block are in a fixed order. The (DS) relay may operate and lock and then wait until the multi-contact relays (DF) and (DG) circuit is closed. When these relays operate the decoder is connected through the connector circuit to the sender which has the connector en-gaged. The operation of the (DP) relay closes ground to the "DB" lead which operates the decoder CBR and associated relays for grounding the "CB" leads. This causes the operation of the (CB) relays belonging to the decoder circuit in all connectors excepting the connector which has the (DF) relay operated. In this connector the (CB) relay is kept normal by a short cir-(CB) relay is kept normal by a short cir-cuit. The (CB) relays open the circuit to their respective (DS) relays and cause the (DS) relays to release if they had been operated. The (CB) relays also ad-vance the start leads to the (CB) relay for the next choice decoder circuit in the same connector.

7.3 When a sender has finished with the decoder circuit it removes battery from the "ST" lead. Relays (DS), (DF) and (DG) in the connector circuit release and relays (DA1) and (DA2) operate and the relays, (CBR) to (CBV), release, leaving the decoder as well as the connector free.

7.4 When a sender multi-contact relay is operated all operated (CB) relays in the connector circuit are held up by their locking windings unless all of them are operated. The locking circuit is broken when all (CB) relays in the connector are operated in order to prevent their being held permanently. The reason for locking them is to prevent a connector which has started to seize a decoder other than its first choice from abandoning that

choice and reverting to an earlier choice if one becomes idle at the critical time.

7.5 If more than one connector up to as

many as there are idle decoders call simultaneously and their choices fall on different idle decoders, all connections are made at once without interference. If their choice falls on the same decoder, all (DS) relays will operate and lock. But the (DS) in the preferred position will open the operating circuit for the other (DS) relays and when the (CB) relays, except the one associated with the (DS) relay in the preferred position, operate they will cause the release of the (DS) relays that were locked up and advance the start wires for these connectors. The unsuccessful senders will be connected to the succeeding idle decoders without appreciable delay, provided there are other decoders available. If there are no available idle decoders the connectors will be required to wait until decoders are available.

7.6 If a number of connectors call while all decoders are busy, they will get service as decoders are freed in a regular order, each freed decoder serving by preference one of the connectors which make it their first choice, and the several connectors in such a group taking turns among themselves.

7.7 The test circuit connects directly to any decoder desired by means of relay (DST) and multi-contact relays in the decoder circuit. The test circuit must wait until relay (DS) releases if the decoder is connected through a connector to a sender before a ground circuit is closed for operating the multi-contact relays.

7.8 In case a connector is seized by the test circuit instead of by a sender, the start lead is not extended to seize the first idle decoder and attach it to the connector. Instead, the test circuit, which has already connected directly to any decoder desired, grounds the "DR" lead corresponding to that decoder, operating the multi-contact relays in the desired connector.

8. DECODER CIRCUIT GUARDED

8.1 A decoder circuit when seized by a connector is guarded against intrusion by the (DS) relay which opens the chain circuit over which ground for operating the multi-contact relays is furnished.

8.2 A busy decoder is further guarded against intrusion and at the same time calls from senders which would normally go to it pass to other decoders, by the operation of the (CB) relays, which open the (DS) relay operate circuit. The (CB) relay serves as a connector busy relay, for the decoder it represents.

8.3 By means of the CB jacks which operate the (CB) relays, a decoder may be made busy in any connector, or if the (DB) jack is used, the decoder is made busy in all connectors.

9. LEADS FROM SENDER TO DECODER

9.1 When a sender has its multi-contact relays operated, and a decoder in the same connector has its multi-contact relays operated, the decoder is connected with the sender over receiving leads and transmitting leads.

9.2 Receiving leads over which the decoder receives from the sender the called office code which was registered in the sender and the service class of the calling subscriber.

> Al,A2,A4,A5) Bl,B2,B4,B5) called office code Cl,C2,C4,C5) Dl,D2,D3,D4 - Service class PS- - Permanent Signal KS- - Key pulsing "A" Swbd. LA - Code in local area EA - Code in extended area

9.3 Transmitting leads over which the decoder transmits to the sender the decoded information for establishing a call.

DB1,DB2,DB3 - District Brusn DG1,DG2,DG4,DG5 - District Group OB1,OB2,OB4,OB5 - Office Brush OG1,OG2,OG4,OG5 - Office Group CR1,CR2,CR3,CR4,CR5 - Compensating Res. CL1,CL2,CL3,CL4 - Class of Call SD) Station letter, above 9999, SD1) High 5 Inc. Group

ND - No district selections

SO - No office selections

TW - Distant office - Tandem-ADCI

TS) TS1) Talking Selection ZC1) and Zone ZC2) OB5 - High 5 office brush selection TDV - Diversion of restricted PBX Traffic for extra charge calls 7DG - 7-Digit MF Call SK2 - Skip 2 Digits on 7DG MF Call

SK3 - Skip 3 Digits on 10 or 7DG MF Call

9.4 Check leads CK1 & CK2 are connected through from sender to decoder and the CK3 lead is grounded in the connector.

Leads CK1 & CK2 pass a temporary ground from the decoder to the sender to ground all the receiving leads which are not grounded in the sender, by means of which the decoder checks all receiving leads for continuity, and also checks that they are not falsely grounded or crossed. Check lead CK3 is used by the decoder for these checks and as a holding ground.

9.5 Release leads RL and TRL are connected through from sender to decoder. The decoder grounds the RL lead to send a regular release signal to the sender. If the decoder is prevented from sending the RL lead signal, the decoder will time out and call in the trouble indicator, followed by grounding the TRL lead as a signal to the sender to make a second trial.

10. CONNECTOR LEADS TO TROUBLE INDICATOR

10.1 When a decoder, which is connected to a sender by the operation of sender and decoder multi-contact relays, times out and seizes the trouble indicator for the taking of a record, the connection with the sender is held momentarily.

10.2 The trouble indicator closes ground over leads "FRC", "SNC" and "CNC" to contacts on the (DG) multi-contact relays associated with this decoder in all connectors. This ground returns to the trouble indicator over leads "FR", "SN" and "CN". The "CN" lead is connected to the "CNC" lead through the front contact of the "DG" relay of the connector involved, and the "SN" lead is connected to the "SNC" lead through the front contact of the (SG) relay of the sender in the connector involved, and the FR lead is connected to the "FRC" lead through a contact on the (DG) relay. This records in the trouble indicator the number of the frame, the position of the connector on the frame, and the position of the sender in the connector. 11. TIME ALARMS AND TROUBLE LAMPS

11.1 Wnen a connector is idle and receptive to a call, all its relays (SS), (TS), (SF), (SG), (TF) and (TG) are normal. If a sender or the test circuit connects battery to its start lead, connector alarm relay (CAl) operates in series. with relay (SS) or (TS).

11.11 If on account of a trouble condition a multi-contact relay fails to operate, interrupter (CA3) operates relay (CA3) and then relay (CA5), the latter in from 5 to 12 seconds after the operation of relays (CA1) and (CA2).

11.12 If a multi-contact relay operates, but on account of a trouble condition it fails to release promptly, interrupter (CA4) operates relay (CA4) and then relay (CA5), the latter in from 5 to 12 seconds after the operation of the multicontact relay.

11.13 If relay (CA5) operates from either of the above causes, it lights a connector time alarm lamp which is common to all connectors, sounds an alarm, and makes all senders associated with the connector busy.

11.2 When a sender seizes its connector and operates its (SG) multi-contact relay a circuit is closed for operating the (DS) relay of the decoder seized. The operation of relay (DS) causes the release of relays (DA1) and (DA2), which close ground to decoder alarm lead "ST" for operating relay (ST) of the decoder circuit. As long as relays (DA1) and (DA2) are released or multi-contact relay (DG) is operated, relay (ST) in the decoder will remain operated from ground over lead "ST".

11.21 Relay (ST) in the decoder actuates a time measure circuit which gives a trouble release if it is held from 1 to 2.3 seconds, and gives a decoder time alarm if it is held for a total of from 2.3 to 3.6 seconds. The decoder time alarm lights a lamp individual to the decoder, and sounds the alarm.

11.3 If relays (CBR) to (CBV) are operated by a false ground, no (DG) relay being operated and no plug being in the (DB) jack, the false ground will connect to the decoder over the "DB" lead and will actuate the time measure circuit in the decoder. When a plug is in the (DB) jack, operating relay (DB), the latter cuts off the "DB" lead to decoder.

11.4 Any trouble which ties up a connector will give the connector time alarm

and if it also ties up a decoder it will also give the decoder time alarm. If a decoder alone is tied up the decoder alarm only will be given.

11.5 By operating the (BAT) key on receipt of a connector alarm, the location of the trouble will be disclosed by the steady lighting of one or two lamps depending upon the location of the trouble.

11.51 One lamp (C) for each connector is lighted by the operation of relay (CA5) or any (DO) multi-contact relay in the connector.

11.52 One sender lamp for each position A to J of a sender in its connector or one lamp (T) is lighted by the operation of an (SG) or (TG) multi-contact relay in any connector.

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values being obtained by connecting to the various terminals designated A, B, C, D, E, F, and N. The resistances are connected to give the following readings.

TABLE A					
Terminal	Volts	MA	External Resistance Values		
A-N B-N E-N F-N Fig. D	0-150 0-30 0-30	1.5 1.5 30 375	100,000 20,000 1,000 Less than 1		

A milliammeter is provided with three scales and is connected to provide voltmilliammeter test conditions as follows.

TABLE B

Test Conditions				
Volts	MA	Ohms		
0-120 0-24 0-24 0-300 ma	1.2 1.2 24 300	100,000 20,000 1,000 3		

Normally 100 volts connected to the meter through 100,000 ohms is the combination used for measuring a high-resistance ground or insulation resistance on a line. By operating the 20,000-ohm key, the 100volt battery and 100,000-ohm resistance, Fig. C, or the 100,000-ohm winding of the meter, Fig. D, are disconnected and 20 volts is connected to the meter through 20,000 ohms. This combination may be used for measuring smaller resistances which could not be accurately determined with the high potential and high resistance. By operating the 1,000-ohm key, the 100-volt battery and 100,000-ohm resistance, Fig. C, or the 100,000-ohm winding of the meter, Fig. D, are disconnected and 20-volt battery through 1,000 ohms is connected to the meter. With Fig. D the operation of the 1,000-ohm key also connects the A 1053-ohm resistor across the (-) and 24-volt terminals of the meter. This combination may be used for obtaining greater accuracy in measuring low resistances, short-circuited capacitors and sticky relays in subscriber sets. The milliammeter is used with a low resistance and shunt for making resistance measurements or current-flow tests by operating the AM key. This key

disconnects the meter from the test battery and connects it normally to the ring side of the test circuit in series with 96 ohms and 24-volt central office battery. The B and C resistors are provided in series with the meter to protect it on maximum current flow, and to give the same ratio of deflection for current readings as for voltage readings on the 150-volt or 120-volt scale.

(h) Continuity test for tube-type subscriber lines.

3.15 Arranged to apply receiver off-hook tone to a subscriber line if the receiver is not on the switchhook.

4. CONNECTING CIRCUITS

(a) Howler Circuit - SD-90057-01.

(b) Permanent Signal Holding Trunk for Sender Make-Busy Frames -SD-21696-01.

(c) Selector Circuit - Line Finder and District Coin Control Circuit -SD-21631-01.

(d) Telephone Circuit for Sender Make-Busy Frame - SD-21707-01.

(e) Test Circuit Local Test Desk No. 14.

(f) Test Circuit for 20-Volt, 100-Volt, 116-Volt and 200-Volt Battery -SD-96120-01.

(g) Timer Circuit, 5A Timer -SD-99304-01.

(h) Miscellaneous Circuit for Miscellaneous Interrupter Frame - SD-21666-01, SD-21667-01.

SECTION IV - REASONS FOR REISSUE

A. Changed and Added Functions

A.1 See revised 3.07 in Section III.

D. Description of Changes

D.1 Options M and N are added to Fig. 1. Option N was previously part of Fig. 1. Option M applies coin potential on tip lead of the line where dial-tonefirst operation is applicable. Option N applies coin potential to both tip and ring leads.

D.2 Circuit Note 122 is added.

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